Journal of Teaching and Education,
CD-ROM. ISSN: 2165-6266 :: 03(03):131–135 (2014)

Journal of Teaching and Education

EFFECTS OF EXTRA MARKS IN COURSE EVALUATION IN ENGINEERING EDUCATION

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This study aimed to evaluate the effect of bonus exercises in the final course evaluation and was conducted at the University of Tartu in an Engineering Graphics course from 2010-2012. We assumed that those students earning extra marks and making an extra effort on their studies would earn a better grade even without the extra marks. The motivation to study was given by teachers and was extrinsic but it could lead to intrinsic motivation when students learn more. However, motivation itself was not under research in this study.

Keywords: Bonus exercise, Engineering education, Evaluation, Exam, Motivation.

Motivational Aspects on Learning

There are different styles to teach and motivate students. Active experimentations, reflecting and discussions are ways to keep students learning actively and engaging them in the learning process (Felder & Silverman, 1988). Students who communicate and take part in the discussions during lectures retain information longer than those who only hear or see it. (Fry & al., 1999; McCarthy & Anderson, 2000) Active learning and motivation also have a correlation (Machemer & Crawford, 2007). Intrinsically motivated students keep learning more and more. Extrinsic motivation can lead to low-level learning and futhermore to ineffective study processes (Fransson, 1977). Intrinsically motivated students can find the joy or importance of a task within themselves but extrinsically motivated students can have varying sources for their motivation (Deci &Ryan, 1985)(Ryan & Connell, 1989)(Hayamizu, 1997). Motivated students work harder and take more time with their tasks and are not discouraged when facing difficulties (Svinicki & McKeachie, 2011). Also, a personal interest in deep learning and learning strategies have an effect on learning results (Schiefele, 1991).

One way to keep motivation high is to make clear connections with information from earlier courses. Students can acquire new information easier when they connect that information with their existing knowledge. If a student has a good basic knowledge he may find relations between new and previously acquired knowledge. (Armstrong & Fukami, 2009)

Extra Marks

Homework and the grading of homework has been under discussion for some time (Bluman & al., 2010). There has been some discussion and tests in several universities (Ehrlich, 2007)(Gijbels & al., 2005) and also in our teaching units whether or not extra exercises or extra marks motivate our students to learn and gain better results. Generally thinking the students should learn more when they study more. Our goal in using extra marks is to encourage students to study harder.

Another benefit is that teachers enjoy sharing their interests and passion for science with their students without thinking only about grades (Svinicki & McKeachie, 2011). Students can be engaged with the topics when they get enough feedback and the grading gives something extra to them (Bluman & al., 2010).

Engineering Graphics Course

The objective of the Engineering Graphics (3 ETCP) course is to give students a knowledge of ISO and ANSI standards for technical drawings and practical experience in composing technical drawings with SolidWorks software. The selection of assignments was based on the idea that they should contribute to the development of students' creativity and motivation to find new/different solutions.

The course has traditional lectures once per week. Computer based laboratory work, where a lecturer or an assistant meets the students, takes place three times at the beginning of the course. This is the time when the students are introduced to SolidWorks software. The laboratory hours are not compulsory but they help the students to start the course. All assignments are individual and compulsory, and a student cannot pass the course without passing them (Kukk & Marandi, 2006) (Kukk & Sõõrd, 2008) (Kukk & Sõõrd, 2011).

The grading is done after the students have sent in their solutions. A two-step feedback process is used during the course: each student gets an individual mark and this follows with generalized feedback during the lecture. The best solutions are presented and analysed during the generalized feedback as examples of good work. Also tips on how to make the solution even better are presented by the lecturer or solicited from the audience. Approximately 60 students participate in every lecture and 4-6 solutions per assignment are presented during the feedback. All students whose solutions are presented get extra marks of up to 20% of the maximum points of the particular assignment. They are not required to present anything in front of the class, as the best solutions are presented by the lecturer. The emphasis is meant to be on the learning and feedback session, where all students are invited to present their ideas how to make the solutions better. Repeated mistakes in the homework are also shown to the whole group, but in this case names are not revealed.

Delivering generalized feedback in the way described above serves two purposes: firstly to reward work well-done, and secondly to attract students' attention to the feedback session. As a rule, there is complete silence and concentration in the auditorium during the feedback, everyone listens to the lecturer and waits to hear whose name will be announced as the author of the best solution, and at the same time is ready to present his/her idea how to make the solutions better. Good ideas presented by students during the feedback are also awarded with extra marks.

Presenting feedback to students in this way allows every student to compare his/her work with the best solutions and there were very few cases where a student did not agree with the grade for their homework.

It is also possible to get some extra marks when answering questions during the lectures. Also, if a student can find a mistake in the lecture slides, extra marks will be given. One or two mistakes have been hidden in the slides per lecture.

Grading procedures during the courses consisted of several parts. The maximum points for 11 different assignments without extra marks totalled 200 and the best student earned 204 points. Students who earned 180 or more points during the semester got a grade A and students earning 160 – 179 points got a grade B. Students who earned 100 – 159 points had to pass an exam and in this case the final grade was an average of their results during the semester and the results of the exam. Extra marks were given by 2, 3 or 5 points for one assignment and the best students earned up to 15 extra marks, which is less than one grade level (20 marks).

As described earlier, students were able to earn extra marks if they succeeded with their homework, found mistakes in the lecturer's presentation or presented a good idea how to improve solutions. During three courses of Engineering Graphics in years 2010 – 2012, 234 students were graded. Out of these students, 107, that is 45.7% of the students in the courses, got the extra marks and 127 students did not. As shown in Table 1, 60 students got extra marks but it did not have any effect on their grades. Thirty-five students were able to upgrade their grades by one grade with the extra marks. Also, as it can be seen in Tables 1 and 2, the students who did get extra marks had better results. There were a lot more A and B grades among the students who got extra marks. Only 5 students out of 107 got a grade of C or D when they also got extra marks. This is only 4.7% of the students. Fifty out of 127 students who did not get extra marks got a grade of C, D or E. This is as much as 39.4% of those students.

Table 1. Student who got the extra marks.

Final grade with bonus marks	Grade without bonus marks	Number of students	Voluntarily passed the exam to upgrade the grade
A	A	42	3
A	B	24	-
B	B	18	-
B - without the exam	-	11	-
B - with the exam	-	4	-
C - with the exam	-	4	-
D with the exam	-	1	-

Table 2. Student who did not get the extra marks.

Final grade (no bonus marks)	Grade without the exam	Grade after passing the exam	Voluntarily passed the exam to upgrade the grade
A	16	2	8
B	42	9	-
C	0	33	-
D	0	14	-
E	0	3	-

Students' Feedback

One hundred and fifty-eight students, that is 68%, of 234 students gave their feedback on the course. The average grade for the Engineering Graphics course was 4.60 on a five point scale. In 2011, the Engineering Graphics course belonged to the top level courses according to students' feedback at the Faculty of Science and Technology at the University of Tartu.

In their feedback, 107 students gave the highest grade to the whole course and 125 students gave the highest grade to the feedback on their homework. The students especially liked the fast feedfack and the help it gave for further studies.

"*Feedback on the homework was very fast and practical*."
"The lecturer quickly graded homework. In addition, the feedback was detailed and useful. The homework was really interesting, it required thinking and using my imagination."
"*The lecturer gave feedback and pointed out details which could be done better".*
"Indicating common mistakes in the homework and their in-depth analysis during the lecturewas good."

Detailed, on-time, positively oriented feedback to homework was mentioned by many students, but extra marks were mentioned only by two students in their feedbacks.

"Bonus marks for well-done homework are very good".
"The lecturer assigned bonus marks and brought out the best examples of outstanding homework. However, he was also demanding in assessing students' work."

The students themselves did not mention the encouraging or motivational effect of the bonus marks. However, it is clear that the marks had some effects on the grades.

Conclusion

This study concentrated on the grades of the Engineering Graphics course. Any motivational aspects did not appear but a remarkable difference among the grades was found. Working hard during the course and successfully completing assignments gave the opportunity to get a good grade without an exam.

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